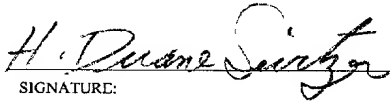
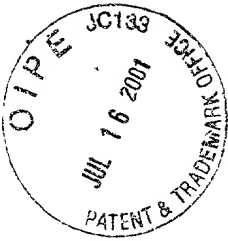


FORM PTO-100 (REV 1-89) DEC 20 2000 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE TRANSMITTED LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER 435808600002
		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 097720525
INTERNATIONAL APPLICATION NO. PCT/EP99/04399	INTERNATIONAL FILING DATE June 24, 1999	PRIORITY DATE CLAIMED June 25, 1998
TITLE OF INVENTION Airtight Food Packaging and a Method, Device and Tray for The Production Thereof		
APPLICANT(S) FOR DO/EO/US Jochen Dietrich, Kurt Römer		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11. to 16. below concern document(s) or information included: 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input type="checkbox"/> Other items or information:		
Express Mail Mailing Label No. EL711877481US Date of Deposit December 20, 2000 I hereby certify that this paper or fees is being deposited with the United States Postal Service Express Mail Post Office to Addressed service under 37 CFR 1.10 on the date indicated above and is addressed to: Assistant Commissioner for Patents, Washington, D.C. By <u><i>Famely Eblen</i></u>		

17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS		PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :						
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO				\$1000.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO				\$860.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO				\$710.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)				\$690.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)				\$100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 860.00		
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 130.00		
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			
Total claims	32 - 20 =	12	X \$18.00	\$ 216.00		
Independent claims	1 - 3 =	--	X \$80.00	\$ --		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$ 270.00		
TOTAL OF ABOVE CALCULATIONS =				\$1476.00		
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$		
SUBTOTAL =				\$		
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$		
TOTAL NATIONAL FEE =				\$		
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$		
TOTAL FEES ENCLOSED =				\$ 1476.00		
				Amount to be refunded:	\$	
				charged:	\$	
<p>a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>1476.00</u> to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>50-1432</u>. A duplicate copy of this sheet is enclosed.</p>						
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>						
<p>SEND ALL CORRESPONDENCE TO:</p> <p>H. Duane Switzer Jones, Day, Reavis & Pogue North Point 901 Lakeside Avenue Cleveland OH 44114</p>				 SIGNATURE: H. Duane Switzer NAME 22431 REGISTRATION NUMBER		

#
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PTO/PCT Rec'd 16 JUL 2001

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Jochen Dietrich et al
Serial No. : 09/720,525
Filed : December 20, 2000
Title : GAS-TIGHT FOOD PACKAGE AND A
METHOD DEVICE AND TRAY FOR
PRODUCING IT
Attorney Docket No. : 435808600002

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Commissioner for Patents Washington,
D.C. 20231

JULY 13, 2001

SUPPLEMENTAL PRELIMINARY AMENDMENT

By:

H Duane Switzer

Commissioner for Patents
Washington, D. C. 20231

Sir:

Supplemental to the preliminary amendment filed March 12, 2001, please amend
this application as follows:

In the Claims:

Please cancel claims 33-61.

Please insert claims 62-96 as follows:

62. (New) A food package tray comprising: a tray having a peripheral side
wall, an inner cavity and an inner surface; an annular collar bonded to said side wall in
outwardly-extending relationship thereto to provide said tray with an outwardly-extending
peripheral flange; and said inner surface and said peripheral flange being lined with a liner film.

63. (New) The food package tray of claim 62 wherein said annular collar includes downwardly extending tabs that are bonded to said inner surface along said side wall.

64. (New) The food package tray of claim 62 wherein said collar is directly bonded to said side wall.

65. (New) The food package tray of claim 62 wherein said collar includes tabs that are fastened to said inner surface along said side wall.

66. (New) The food package tray of claim 62 wherein said tray and collar comprise paperboard cutouts.

67. (New) The food package tray of claim 62 wherein said liner film comprises a multi-layer plastic film including an oxygen barrier layer of polyvinyl alcohol, a sealing layer of peelable polyethylene, and an adhesive layer of modified polyethylene that comprises a copolymer of ethylene with 6% methacrylic acid that is 50% neutralized with sodium or zinc ions.

68. (New) The food package tray of claim 62 wherein the liner film has a thickness in the range of 100-150 μm .

69. The food package tray of claim 62 wherein said cavity is sealed by a lid film bonded to said peripheral flange.

70. (New) The food package tray of claim 69 wherein said lid film is formed by a multi-layer plastic film having on the side facing the tray a peelable plastic layer of polyethylene, at least one oxygen barrier layer of polyvinyl alcohol overlying the polyethylene layer, and a covering thermal barrier layer of polypropylene.

71. (New) The food package tray of claim 62 wherein the tray and the collar are of recyclable multi-layer paperboard.

72. (New) The food package tray of claim 71 wherein the paperboard comprises a cover layer facing the outside of the package and having a printable first surface structure and an inside layer having a second surface structure for bonding to said liner film.

73. (New) The food package tray of claim 72 wherein the inside layer is of recycled paperboard.

74. (New) A method for gas-tight packaging of food comprising the steps of: providing a tray having an inner surface, a peripheral side wall and a peripheral flange extending outwardly from the side wall, the flange being formed by an annular collar that is bonded to the side wall; transporting aligned rows of trays through a forming station wherein a liner film is bonded to said inner surface and said flange; transporting the lined trays through a tray loading station wherein the trays are loaded with food; and transporting the loaded trays through an evacuating and sealing station wherein the interior of the trays is evacuated and a sealing film is bonded to the flange over the tray.

75. (New) The method of claim 74 wherein the step of lining the trays is carried out by tacking a multi-layer plastic liner film to said flange followed by forming the plastic liner film downwardly into the tray.

76. (New) The method of claim 74 wherein the plastic liner film includes a gripping portion along the tray flange and the trays are transported by gripping the gripping portion.

77. (New) The method of claim 74 wherein the liner film is heated and formed into the trays by providing a pressure difference on opposite sides of the liner film, and said liner film is heat bonded with the interior surface of the trays and with the peripheral flange.

78. (New) Apparatus for gas-tight packaging of food in trays having an inner surface, a peripheral side wall and a peripheral flange extending outwardly from the side wall, the flange being formed by an annular collar that is bonded to the side wall, the apparatus comprising: a first module having a forming station, a loading station and an evacuating station; a transport device for transporting the trays past the forming, loading and evacuating station; a second module upstream of the first module and including a tray feed device for feeding trays to the first module; the first and second modules overlapping in the direction of tray transport.

79. (New) The apparatus of claim 78 wherein the first module includes a tack welding station upstream of the forming station; and a transfer station between the first and second modules beneath the tack welding station.

80. (New) The apparatus of claim 79 wherein the transfer station includes a vertically movable lifting device that engages the peripheral flange on the trays, the tack welding station including a tack welding body vertically movable in a direction opposite to the direction of movement of the lifting device, and a plastic liner film supply device for positioning a liner film over a tray peripheral flange for tack welding to the flange.

81. (New) The apparatus of claim 80 including a heating device that heats the tack welding body to tack weld the liner film to the tray peripheral flange.

82. (New) A method for assembling a food package tray comprising the steps of: forming a cutout blank having a bottom and side walls; bending the side walls relative to the bottom to form a peripheral side wall; positioning an annular collar on the side wall; and bonding the collar to the side wall to provide the tray with an outwardly extending peripheral flange.

83. (New) The method of claim 82 wherein said side walls are bent in a first mold and said collar is positioned on said side wall in a second mold.

84. (New) The method of claim 82 wherein said step of bonding is carried out by bonding with a cold adhesive.

85. (New) The method of claim 82 wherein the step of bonding is carried out by bonding with a hot melt adhesive.

86. (New) A tray having a peripheral side wall and a peripheral flange extending outwardly from said side wall, said flange being a separate annular collar that is fastened to said side wall.

87. (New) The tray of claim 86 wherein the tray has an inside surface and said collar includes tabs that are fastened to said inside surface along said side wall.

88. (New) The tray of claim 86 wherein said tray is a paperboard cutout.

89. (New) The tray of claim 86 wherein said tray has a bottom and said side wall is outwardly inclined from said bottom toward said collar.

90. (New) The tray of claim 86 including a bottom integral with said side wall, said bottom having a polygonal peripheral shape.

91. (New) The tray of claim 86 wherein said side wall has outwardly extending side wall flange segments and said collar is fastened to said side wall flange segments.

92. (New) The tray of claim 86 including a bottom integral with said side wall, said bottom and side wall defining a cavity having a cavity inner surface, and said cavity inner surface and said collar being lined with a liner film.

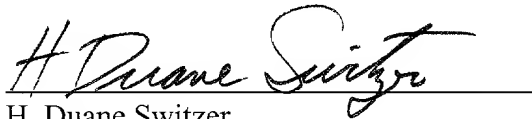
93. (New) The tray of claim 92 including a lid film bonded to said collar for sealing said cavity and forming a food package.

94. (New) The tray of claim 86 wherein said tray has an inner surface, and a plastic liner film overlying and bonded to said inner surface and said collar.

95. (New) The tray of claim 86 wherein said collar is fastened to an inwardly facing surface of said side wall.

96. (New) The tray of claim 86 wherein said collar is fastened to an upwardly facing surface of said side wall.

Respectfully submitted,

A handwritten signature in cursive script, reading "H Duane Switzer", written over a horizontal line.

H. Duane Switzer

Reg. No. 22,431

Jones, Day, Reavis & Pogue

North Point

901 Lakeside Avenue

Cleveland, Ohio 44114-1190

216-586-7283



JCO9 Rec'd PCT/PTO 12 MAR 2001

PATENT #3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Jochen Dietrich et al
Serial No. : 09/720,525
Filed : December 20, 2000
Title : GAS-TIGHT FOOD PACKAGE AND A
METHOD DEVICE AND TRAY FOR
PRODUCING IT
Attorney Docket No. : 435808600002

**PRELIMINARY AMENDMENT PRIOR
TO CALCULATION OF THE FILING FEE**

Commissioner for Patents
Washington, D. C. 20231

Sir:

Prior to calculation of the filing fee, please amend this application as follows:

In the Claims:

Please cancel claims 1-32.

Please insert claims 33-61 as follows:

33. (New) A food package comprising: a tray having a peripheral side wall,
an inner cavity and an inner surface; an annular collar bonded to said side wall in outwardly-

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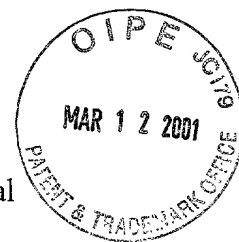
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for Patents, Washington, D.C.

By

H. Duane Switzer



extending relationship thereto to provide said tray with an outwardly-extending peripheral flange; said inner surface and said peripheral flange being lined with a liner film; and said cavity being sealed by a lid film bonded to said peripheral flange.

34. (New) The package of claim 33 wherein said annular collar includes downwardly extending tabs that are bonded to said inner surface along said side wall.

35. (New) The package of claim 33 wherein said collar is directly bonded to said side wall.

36. (New) The package of claim 33 wherein said collar includes tabs that are fastened to said inner surface along said side wall.

37. (New) The package of claim 33 wherein said tray and collar comprise paperboard cutouts.

38. (New) The package of claim 33 wherein said liner film comprises a multi-layer plastic film including an oxygen barrier layer of polyvinyl alcohol, a sealing layer of peelable polyethylene, and an adhesive layer of modified polyethylene that comprises a copolymer of ethylene with 6% methacrylic acid that is 50% neutralized with sodium or zinc ions.



39. (New) The package of claim 33 wherein said lid film is formed by a multi-layer plastic film having on the side facing the tray a peelable plastic layer of polyethylene, at least one oxygen barrier layer of polyvinyl alcohol overlying the polyethylene layer, and a covering thermal barrier layer of polypropylene.

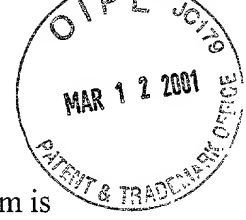
40. (New) The package of claim 33 wherein the liner film has a thickness in the range of 100-150 μm .

41. (New) The package of claim 33 wherein the tray and the collar are of recyclable multi-layer paperboard.

42. (New) The package of claim 41 wherein the paperboard comprises a cover layer facing the outside of the package and having a printable first surface structure and an inside layer having a second surface structure for bonding to said liner film.

43. (New) The package of claim 42 wherein the inside layer is of recycled paperboard.

44. (New) A method for gas-tight packaging of food comprising the steps of: providing a tray having an inner surface, a peripheral side wall and a peripheral flange extending outwardly from the side wall, the flange being formed by an annular collar that is bonded to the side wall; transporting aligned rows of trays through a forming station wherein a liner film is bonded to said inner surface and said flange; transporting the lined trays through a tray loading station wherein the trays are loaded with food; and transporting the loaded trays through an



evacuating and sealing station wherein the interior of the trays is evacuated and a sealing film is bonded to the flange over the tray.

45. (New) The method of claim 44 wherein the step of lining the trays is carried out by tacking a multi-layer plastic liner film to said flange followed by forming the plastic liner film downwardly into the tray.

46. (New) The method of claim 44 wherein the plastic liner film includes a gripping portion along the tray flange and the trays are transported by gripping the gripping portion.

47. (New) The method of claim 44 wherein the liner film is heated and formed into the trays by providing a pressure difference on opposite sides of the liner film, and said liner film is heat bonded with the interior surface of the trays and with the peripheral flange.

48. (New) Apparatus for gas-tight packaging of food in trays having an inner surface, a peripheral side wall and a peripheral flange extending outwardly from the side wall, the flange being formed by an annular collar that is bonded to the side wall, the apparatus comprising: a first module having a forming station, a loading station and an evacuating station; a transport device for transporting the trays past the forming, loading and evacuating station; a second module upstream of the first module and including a tray feed device for feeding trays to the first module; the first and second modules overlapping in the direction of tray transport.

49. (New) The apparatus of claim 48 wherein the first module includes a tack welding station upstream of the forming station; and a transfer station between the first and second modules beneath the tack welding station.



50. (New) The apparatus of claim 49 wherein the transfer station includes a vertically movable lifting device that engages the peripheral flange on the trays, the tack welding station including a tack welding body vertically movable in a direction opposite to the direction of movement of the lifting device, and a plastic liner film supply device for positioning a liner film over a tray peripheral flange for tack welding to the flange.

51. (New) The apparatus of claim 50 including a heating device that heats the tack welding body to tack weld the liner film to the tray peripheral flange.

52. (New) A method for assembling a food package tray comprising the steps of: forming a cutout blank having a bottom and side walls; bending the side walls relative to the bottom to form a peripheral side wall; positioning an annular collar on the side wall; and bonding the collar to the side wall to provide the tray with an outwardly extending peripheral flange.

53. (New) The method of claim 52 wherein said side walls are bent in a first mold and said collar is positioned on said side wall in a second mold.

54. (New) The method of claim 52 wherein said step of bonding is carried out by bonding with a cold adhesive.

55. (New) The method of claim 52 wherein the step of bonding is carried out by bonding with a hot melt adhesive.



56. (New) A tray having a peripheral side wall and a peripheral flange extending outwardly from said side wall, said flange being a separate annular collar that is fastened to said side wall.

57. (New) The tray of claim 56 wherein the tray has an inside surface and said collar includes tabs that are fastened to said inside surface along said side wall.

58. (New) The tray of claim 56 wherein said tray is a paperboard cutout.

59. (New) The tray of claim 56 wherein said side wall is outwardly inclined from said bottom toward said peripheral flange.

60. (New) The tray of claim 56 wherein said bottom has polygonal peripheral shape.

61. (New) The tray of claim 56 wherein said tray has an inner surface, and a plastic liner film overlying and bonded to said inner surface and said peripheral flange.

Respectfully submitted,



H. Duane Switzer
Reg. No. 22,431
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901 Lakeside Avenue
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PTO/SB/21 (08-00)

Approved for use through 10/31/2002. OMB 0651-0031

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TRANSMITTAL FORM <i>(to be used for all correspondence after initial filing)</i>	Application Number	09/720,525
	Filing Date	12/20/2000
	First Named Inventor	Jochen Dietrich et al
	Group Art Unit	-
	Examiner Name	-
Total Number of Pages in This Submission	Attorney Docket Number	435808600002

ENCLOSURES (check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Assignment Papers (for an Application)	<input type="checkbox"/> After Allowance Communication to Group
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<input checked="" type="checkbox"/> Preliminary Amendment / Reply	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
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<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address	<input type="checkbox"/> Other Enclosure(s) (please identify below):
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<input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	H. Duane Switzer
Signature	<i>H. Duane Switzer</i>
Date	March 12, 2001

CERTIFICATE OF MAILING			
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231 on this date: 03/12/2001			
Typed or printed name	H. Duane Switzer		
Signature	<i>H. Duane Switzer</i>	Date	03/12/2001

Burden Hour Statement This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

DescriptionGas-Tight Food Package and a Method, Device and Tray for Producing It

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The invention relates to a food package in accordance with the preamble of claim 1 as well as a method for producing a like package in accordance with claim 13, a device for carrying out a like method in accordance with the preamble of claim 19, and a suitable semi-finished product or tray having the form of erected and bonded trays in accordance with claim 23, and a method for producing it.

A large variety of food packages is being marketed, with particular efforts being made in recent years to restrict the content of non-recyclable plastics materials in such packages to a minimum. Preference has hitherto been given to food packages in the form of deep-drawn plastic trays generally thermo-formed of a carrier material which is comprised, e.g., of PVC, polystyrene or polyester.

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In the conventional trays produced of PVC, polyester or polystyrene, due to conditions of production technology on so-called "vacuum forming and loading plants", there results a very inhomogeneous thickness distribution based on the starting thickness available in the known thermoplastic deformation process.

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Hereby on the one hand a high starting thickness of up to 1000 μm is necessitated with respect to the desired molding depth and container shape in order to obtain the required remaining wall thicknesses in the rounded bottom portions. On the other hand, thickness reduction of the plastic films employed for forming the plastic trays in the rounded bottom portions very frequently results in so-called "buckling" which may occur particularly during transport.

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It was equally found in serial investigations that the barrier layer employed in producing the plastic trays, preferably of polyvinyl alcohol

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(PVA), which ensures the required oxygen barrier and is embedded between carrier film and seal layer in a previously described application of so-called rigid-film compounds, presents a substantially poorer molding result, i.e., low remaining wall thicknesses also of this PVA layer.

It is therefore evidently necessary for the plastics carrier material of the trays to be formed, which is required for dimensional stability, to be equipped with an additional oxygen barrier layer. This oxygen barrier layer generally consists of polyvinyl alcohol. In addition a third film layer is necessary in order to be able to produce the seal of the lid film.

This necessitates a relatively thick, so-called multi-layer compound film consisting of several components which preclude recycling in the sense of reuse of unalloyed materials.

A tray of this type is described e.g. in EP 0169799. Moreover there is disclosed in it a method wherein a multiplicity of individual, separate trays are introduced into a loading station and a sealing station. The trays are successively lined with a thin plastic layer before being loaded with foods and supplied to a sealing station. In the sealing station, a cover film is heat-bonded onto the trays loaded with foods. The result is a tray essentially having mechanical wood pulp or foamed plastics for a carrier material. The advantage of these packaging systems with the like trays resides in the fact that the packaging device may be given a clear-cut structure, with a modular composition of the device also being possible.

In comparison, attempts have been made to reduce the plastics content in the like food packages, which must be comparatively high in order to obtain the necessary remaining wall thicknesses in the rounded bottom portions, by employing coated paperboard. Herein it was, however, found that it is difficult to process paperboard with coated plastics materials in devices employing largely known, or already existing, modules. In addition, the maximum molding depths are limited

to 25 to 30 mm in such containers pressure-molded of coated paperboard.

Even though such containers produced in the cold molding technique are equipped to be largely oxygen-tight due to a barrier layer coating, wrinkles will form as a result of the cold molding technique due to the resulting displacement of material. These wrinkles reach as far as into the flange region of the containers, making secure and uninterrupted, but particularly oxygen-tight sealing with the cover film impossible. In order to produce for example container depths of more than 30 mm molding depth, receptacles of coated paperboard are used which are formed of cutouts. These receptacles of coated paperboard produced on a separate installation are erected, folded and bonded and supplied to the packaging system as containers.

It is, however, not successful to obtain truly gas- and oxygen-tight connections of such containers produced of coated cutouts at the cut or bonded portions thereof. Such problems particularly occur with containers presenting a peripheral flange. By the priorly known coating of paperboard cutouts merely a certain resistance against humidity is obtained, while humidity may nevertheless not be screened off entirely at the open cut edges.

There is, however, a need to furnish a food package in accordance with the preamble of claim 1, which may be produced on a conventional horizontal forming, loading and sealing plant at low expense for modification, wherein the plastics content is reduced to a minimum, however at the same time stability of the receptacle and oxygen tightness may be maintained on a particularly high level.

It is another need to further develop a method for oxygen-tight packaging of food products by employing a food package of the above specified type in such a way that packaging plants of a conventional modular construction may be operated at a higher number of work cycles and even more economically. Finally it is another object of the invention to find a device for carrying out the above mentioned method,

which is characterised by particularly low susceptance of packaging plant trouble even at a maximum number of work cycles.

5 In order to satisfy these requirements, there is proposed in the older patent application P 196 54 230, the contents of which are here specifically referred to, a food package as well as a method for producing it, and a device for implementing the method with a suitable semi-finished product, or tray.

10 The food package proposed there comprises as a supporting base a paperboard cutout lined with a thin compound plastic film, which is capable of being erected automatically and the internal region of which is bonded at the cut edges. The paperboard cutout moreover comprises a peripheral flange with single peripheral flange segments to which the
15 lid film is then secured. In addition, the peripheral flange in accordance with the invention is given an external shape such that the peripheral flange segments abut against each other in the sealing position. To this end, the individual peripheral flange segments comprise predetermined cutting lines whereby the angular position of the peripheral flange may
20 then be determined. Owing to the use of pre-fabricated paperboard cutouts there results the advantage that during erecting the paperboard cutouts a thickness reduction of the material will not occur in contrast with the known tray. Hereby the drawbacks incurred by thickness reduction of the material are overcome by the food package of the
25 invention. Due to the fact that the peripheral flange segments abut against each other in the sealing position, there results an unbroken peripheral flange surface which is then employed for secure sealing of the paperboard cutout.

30 In the like gas- or oxygen-tight packages, particular care must, however, be taken that the tightness produced by way of the seal flanges will be ensured over a prolonged period of time. Otherwise, the specifications in terms of food processing technology cannot be satisfied. In the previously proposed package, the quality of the seal is
35 determined by the accuracy of the cutouts. In other words, the chance of ambient air by and by penetrating into the package via capillaries in

the seal flange can be prevented only through extremely high accuracy in production of the erected trays and in positioning inside the lining and sealing station. Hereby the operating speed may be lowered unduly.

5 The invention is therefore based on the object of furnishing a food package of the above described type, which is characterised by the above described advantages and additionally in that it may be produced more quickly and reliably with lasting gas and oxygen tightness. It is another object to provide a method for producing such a food package
10 which may be carried out in accordance with a simple process. Finally it is an object to furnish a device for implementing the production method, which has a simple structure and offers the particularly advantageous possibility of integrating conventional packaging plants into the device to a maximum possible extent. Finally it is moreover intended to furnish a
15 semi-finished packaging or packaging tray which is in a particularly advantageous manner suited for the packaging method of the invention, with the design being intended to have the advantage that a high number of pieces per time unit may be produced at such high precision that the quality demands of an oxygen-tight packaging are ensured even
20 at maximum throughput of the packaging plant.

 This object is attained with respect to the food package by the features of claim 1. In accordance with the invention, the packaging is
25 equipped with a continuous collar which thus provides a continuous surface for sealing of the packaging. The continuous, i.e., uninterrupted collar presents advantages even for tack-welding of the plastic film lining the inside of the packaging inasmuch as optimum preconditions for large-surface connection between plastic film and flange are furnished. Apart from this, it results in the additional advantage that damage to the
30 plastic film may be precluded even at elevated operating speeds of the packaging machine. The decisive advantage becomes apparent upon sealing of the packaging. Namely, the uninterrupted surface of the flange covered by the plastic film provides optimum preconditions for a maximum possible seal connection of the lid film. It has been found that
35 in this way the operating speeds of the packaging machine may be raised considerably without running the risk of capillary-type radial

channels deducting from long-term tightness being formed between lid film and lining film.

The design of the food package according to the invention does
5 require a somewhat more complex structure of the package cutout. It was, however, found that the continuous peripheral flange may in a particularly advantageous manner be utilised for stabilisation of the packaging trays even where the connection between the tray components is executed in points or regions only and not full-surface.

10

A particularly advantageous development results from the development of claim 2. This design permits weight savings in the range of the tray part, having a positive effect on DSD expenditures.

15

Basically it is possible to design the attached uninterrupted collar as a closed ring. By the development of claim 3, however, the particular advantage of reduced waste production is attained. In other words, paperboard material may sensibly and effectively be utilised for stabilisation of the side walls of the tray part.

20

If the tabs of the flange are fastened, preferably bonded, to the side walls of the tray part, there results the particular advantage that the entire outer side of the side walls may be used for printing, i.e., as a information and publicity surface.

25

The packaging of the invention is particularly suited for a semi-finished product of paperboard.

If, according to claim 6, the compound plastic film comprises an
30 oxygen barrier layer, preferably of polyvinyl alcohol, a seal layer, preferably of peelable polyethylene, as well as an adhesive layer, preferably of modified polyethylene, in particular a copolymer of ethylene with 6% methacrylic acid partially (50%) neutralised with Na or zinc ions (Surlyn A), a flexible compound is used whose oxygen
35 permeability may be set in advance and will not change even in the embedded state. Consequently a clearly thinner PVA layer embedded in

a flexible compound may be used. Peelability of the plastic film results in excellent environmental compatibility. The plastic film may - as was found surprisingly - be kept extremely thin and yet stabilise the tray, even one consisting of simple paperboard, such that even relatively deep
5 packages may be produced with sufficient high stability.

If the food package of the invention according to claim 9 is preferably equipped with a paperboard cutout consisting of recyclable or preferably two-layered paperboard, then a food package is obtained
10 which is suited for carrying an imprint with a particularly strong publicity appeal on the outer layer of the paperboard cutout. Thus in particular a possibility of optically accentuating the food package according to the invention is being furnished.

15 The design in accordance with claim 10 has the particular advantage of the surface structure of the trays being adapted to the specific requirements. For lining of the tray it is advantageous if the plastic film heated during forming within a short period of time enters into an intimate connection with the surface of the tray part. For the
20 outer side of the tray part, in contrast, it is essential to furnish an appealing appearance and good preconditions for the printing which will have to be carried out as a rule. It was found that the second, i.e. inner-side layer may readily consist of recycled paperboard, whereby costs may be saved and particular advantages with respect to environmental
25 compatibility are attained.

Due to the selection of lined paperboard cutouts in accordance with the invention, a container is provided which is oxygen-tight upon entry into the evacuating and sealing station with the exception of one side,
30 i.e. the top. As moreover the plastic-lined paperboard cutout has particularly high dimensional stability also in the range of the peripheral flanges having a particular design in accordance with the invention, this peripheral flange may securely be accommodated between the gaskets of the closed sealing tool, so that according to the invention only the
35 inner cavity of the shaped substrate tray needs to be evacuated. Power consumption of the packaging plant for the purpose of performing

evacuation is reduced, whereby the number of work cycles of the packaging plant may be raised considerably.

It was found that owing to the peripheral flanges designed in accordance with the invention, an uncontrolled breakage cannot take place even while the trays are being loaded with food products. Operational reliability of the device may moreover additionally be raised in that the peripheral flanges positioned between the substrate tray inner cavities and having the form of sealing ridges are supported from below by means of sliding and guide rails oriented in parallel with the direction of transport. Moreover advantageous is the development where the containers are supported from below in the loading path by means of a supporting belt running in synchronicity with the transport means.

Owing to the fact that the erected paperboard cutouts of the invention in accordance with claim 15 are arranged in line in the forming station, it becomes possible to form a broadened sealing surface on the peripheral flanges between adjacent paperboard cutouts. As a result, sealing is reliably obtained. As a further result, several paperboard cutouts may be produced simultaneously, and through the broadened sealing area owing to adjacently arranged peripheral flanges, sealing is facilitated.

These developments in particular bring about advantages of far-reaching simplification of a packaging plant, as in this method a separate deep-drawing die station or particular pre-heating systems are not required any more. Nevertheless the path of passage required for these may, in accordance with the invention, be utilised for accommodating the loading station, and thus a space-saving embodiment of such a packaging plant may be created.

Either the plant may altogether become considerably shorter, or the loading path - where necessary - may clearly be made better use of, whereby the loading process will be clearly facilitated in some cases.

By the food package according to the invention the content of non-recyclable plastics may be reduced to a minimum, with the additional advantage of non-problematic decaying resulting from the selection of material for the paperboard cutouts in accordance with the invention.

5

Finally power consumption of the packaging plant particularly in the range of the forming station is reduced considerably as the time required for heating through a customary rigid film of approx. 500 to 1000 μm (PVC, polystyrene or polyester) may clearly be reduced. The required
10 inherent stability of the containers is achieved in accordance with the invention by the use of the described paperboard cutout, in particular if the lid film is secured to the plastic film lining the paperboard cutout.

The food package of the invention is provided with an increased
15 dimensional stability in comparison with food packages equally employing paperboard cutouts, and is highly resistant against torsional deformation.

One advantageous development of the production method results
20 from the development of claim 15. Due to tack-welding the plastic film to the peripheral flanges of the trays, the latter may reliably and particularly in synchronicity be transferred into the packaging plant. This results in the additional advantage that the module of the packaging plant containing the loading plant may be preserved largely without
25 modifications while an upstream module for feeding the trays may be positioned in particularly space-saving arrangement, i.e., overlapping by the advancing distance of one work cycle inside the plant.

The development of the method according to claim 17 results not
30 only in an extremely high throughput rate but in particular has the advantage, in combination with the design of the tray part in accordance with the invention, of permitting extremely efficient use of the suction pressure in order to draw the lining film into the cavity of the tray part within a minimum period of time. Namely, the uninterrupted collar
35 forming the flange permits a design of the tray part cutout in such a way

that the side walls will be separated by a slot due to the erected condition of the tray part.

Advantageous developments of the device for carrying out the method are the subject matters of appended claims 19 to 25. The tray forming part of the food package according to the invention is the subject matter of claims 23 to 29. The tray may be given just about any configuration, wherein the particular advantages may be obtained if the tray part exceeds a certain minimum depth. Preferably the bottom has a polygonal shape.

Thanks to the method of producing the trays according to claim 30 it is possible to join the parts of the trays together in minimum time and with maximum possible accuracy, thus achieving the advantage that tray production remains independent of the operating speed of the packaging plant. The trays are in a preferred manner supplied from a magazine for paperboard trays in a nested condition and from there individually supplied onto a transport belt of the transfer module of the packaging machine.

Further advantageous embodiments are the subject matters of the remaining appended claims. Hereinbelow an embodiment of the invention shall be explained in more detail by making reference to schematic drawings, wherein:

Fig. 1 is a schematic lateral view of a first embodiment of the packaging plant of the invention;

Fig. 2 is an exploded representation of a first embodiment of a paperboard tray for use in manufacture of a packaging according to the invention;

Fig. 3 is a top view of a paperboard cutout for the collar of the packaging according to Fig. 2;

Fig. 4 is a top view of the cutout according to Fig. 3, with tabs folded ready for assembly;

5 Fig. 5 is a top view of the associated paperboard cutout for the tray part;

Fig. 6 is a top view of the cutout according to Fig. 5 in the erected form;

10 Fig. 7 is a perspective view of a row of erected paperboard cutouts;

Fig. 8 is a lateral view in an enlarged scale of the forming station of the packaging plant;

15 Fig. 9 is a front view of the forming station shown in Fig. 8 with introduced paperboard cutouts in contiguously aligned arrangement and the compound plastic film supplied for lining;

20 Fig. 10 is a perspective view of paperboard cutouts aligned side by side and already lined with the compound plastic film, where in a sectional view represented in a somewhat enlarged scale according to Fig. 10A along the row of aligned paperboard cutouts indicated by the arrow, the thermo-bonded flange region is represented;

25 Fig. 11 is a front view of the evacuating and sealing station with inserted paperboard cutouts, already lined with compound plastic film and thus combined into a row;

30 Fig. 12 is a perspective view of the cohering paperboard cutouts with compound plastic film and sealed lid film, where in Fig. 12A the details of the paperboard cutout and of the adhering layers are represented more clearly in an enlarged scale;

35 Fig. 13 is a perspective view of a tray of the invention ready for use or consumption;

Fig. 14 is a perspective view of the tray of the invention with partly peeled-off lid film;

5 Fig. 15 is a perspective view of the tray of the invention with partly peeled-off lid film and partly peeled-out inner film;

Fig. 16 is a schematic representation of a cutout of the plant for manufacturing the paperboard trays;

10

Fig. 17 is an exploded representation corresponding to Fig. 2 of an alternative development of the tray; and

15 Fig. 18 is a view of the packaging machine similar to Fig. 1, wherein the trays according to Fig. 17 are processed.

Fig. 1 shows a lateral view of the packaging plant essentially consisting of five stations, namely a tack-welding station HS for tack-welding a lining film 134 for pre-fabricated trays, a forming station (FS) in which the plastic film is formed into the trays, a loading path (BS), a sealing and evacuating station (VS), and a preferably two-stage separating plant 181, 182, which latter one may as well have a one-stage construction.

25 Transport of the fittingly aligned paperboard cutouts or erected trays 110 to the single stations is preferably achieved through a transport chain 148 or, when employed on a so-called "Tray-Sealer", through a specially designed transport belt having receiving spaces for the paperboard cutouts positioned side by side.

30

Supporting belts not shown in detail may additionally be provided underneath the transport chain 148 for reducing the load on the transport chain 148 in single sections.

35 The module designated by "I" of the packaging machine proper, which largely has the form of a commercially available machine and may

be modified merely in certain areas is preceded by another module II, whereby separation of the nested trays 110 accommodated in a magazine or dispenser 112 and their delivery to module I is performed.

5 In detail, the pre-fabricated paperboard cutouts 110 - preferably adjacent in rows of 2 to 5 trays - are with the aid of a separating device VV9 preferably operating pneumatically supplied in fixed-cycle control onto a partitioned belt 112, whereby furthermore the at least one paperboard cutout is transported into a transfer station ÜS. There, also
10 in fixed-cycle control, the at least one tray 110 is raised in a vertical upward direction into the plane EKF of the plastic film 134 and into the range of the tack-welding station HS by means of a raising station 114 employing a dedicated transport die 113; the lining film is then tack-welded preferably at single points to the leading and/or trailing regions
15 of the tray flanges by means of heatable dies 118. In a Tray-Sealer-System, the paperboard cutouts are inserted into corresponding reception spaces of the transport chain 148.

By this configuration it is possible to arrange module II at very low
20 space demand, and to do away with the overlapping region ÜB in the direction of transport.

Starting out from this tack-welding station, in which the abuttingly aligned pre-fabricated trays contact the plastic film and enter into the
25 forming station FS, the actual process of shaping or lining the trays 110 by means of the plastic film, preferably the compound plastic film 134, begins. In the forming station, lining of the inner surface of the contiguously aligned paperboard trays 110 with an oxygen-barrier compound plastic film 134 is performed.

30 The compound plastic film 134 is drawn from an endless reel 133 mounted above the introduction path of the packaging plant on a carrier arm via deflection rollers over the trays 110 aligned in the receiving molds and substantially in parallel with the transport chain 148.

35

When a Tray-Sealer is used, the transport chain¹ 148 in fixed-cycle control feeds the aligned trays 110 resting in the receiving spaces of the transport chain underneath a forming station FS; the operating principle of this forming station for lining the inner surfaces of the trays 110 with the compound plastic film 134 corresponds to the one of the Iso-Pack-System of MULTIVAC as used in a forming, loading and sealing plant.

Subsequently, the trays 110 are conveyed by means of the transport chain 148 into the range of a loading path² BS which is also designed such as to permit in-line loading in fixed cycles.

In order to reduce the load on the transport chain 148, the trays 110 now cohering by the compound plastic film 134 may be supported by a supporting belt operating in synchronicity with the transport chain.

From the loading path BS the loaded trays pass into an evacuating and sealing station VS, wherein concurrently a lid film 120 fed from an endless reel 122 via a system of deflection rollers is supplied into the evacuating and sealing station VS substantially in parallel with the transport path. The function of the evacuating and sealing station VS corresponds to that of conventional systems, e.g. by Multivac, and is described in detail in Fig. 12.

Following sealing of the loaded packaging containers, these are in turn supplied to the separating stations 181, 182 by means of the transport chain, wherein it is again possible to support the aligned, cohering trays 110 by means of a synchronously operating transport belt 150.

As can also be seen in Fig. 1, the transport path of the transport chain 148 and of the supporting belt 150 extends from the dispenser to immediately downstream of the two-stage separating station 181, 182, so that the entire plant operates in synchronicity.

It is a particularity of the packaging device that on the one hand, a specially designed tray 110 is employed, and on the other hand, this

tray 110 is supplied to the packaging plant in a particular manner, namely in the form of a specially designed semi-finished product.

Contrary to conventional types of such packaging plants, a tray 10
5 already pre-formed and dimensionally stabilised e.g. by bonding, which
comprises a top-side peripheral flange 52, is supplied by the dispenser
112. The semi-finished products or trays 10 supplied to the packaging
device - as is shown in the exploded view of Fig. 2 - in accordance with
the invention comprise specially designed peripheral flanges 52
10 constituted by a continuous collar placed onto a tray part 40.

Fig. 2 shows the two components of the trays 10 in the pre-
fabricated condition immediately prior to assembly and connection,
preferably bonding, of the parts. Figs. 3 to 5 show detailed top views of
15 the parts.

Both parts are designed as paperboard cutouts, with preferably a
two- or multi-layer paperboard being used, so that the outsides of the
trays may have properties different from those of the insides. The cutout
20 for the collar constituting the flange 52 - as shown in Fig. 3 - presents
cuts for forming trapezoidal tabs 51 which are connected to the flange
through predetermined folds.

The tray part 40 has a cut shape in accordance with Figs. 5 and 6.
25 To a bottom part 41 there are connected through folds 42 the side wall
portions 43 contacting each other in the erected condition (Fig. 6 and
Fig. 2).

Inasmuch as the tabs 51 having an angular configuration are
30 connected, preferably bonded, while placed on the tray part 40 with the
side walls 43, the latter are stabilised by the flange 52, resulting in high
torsional rigidity of the trays at low material expenditure.

The bonding connection is preferably carried out in the form of dots
35 or lines, as is indicated by the hatched regions 47 in Fig. 2.

The tabs 51 are secured to the inner side of the side walls 43, so that the outside of the side walls remains continuous, which is favorable for printing.

- 5 The height H43 of the walls 43 is greater than the height H51 of the tabs 51, i.e., the tabs only encompass a fraction of the side walls, resulting in savings in term of weight and thus DSD expenditure.

- 10 Fig. 7 is a perspective representation of erected and aligned paperboard cutouts 10 also revealing an optionally provided gripping recess GM which may be provided on an edge segment of the flanges 52.

- 15 The lateral view of Fig. 8 shows the manner in which the tool parts 116 and 118 in the forming station FS cooperate with the contiguously aligned trays and by means of heating means 172 line the inner surfaces and surfaces, respectively, of contiguously aligned trays 10 with the compound plastic film 134.

- 20 The tool of the forming station FS, which operates according to the so-called Skin method, is comprised of a lower mold 116 and an upper mold 118 which are synchronously moved apart and approached in accordance with the arrow shown in Fig. 8. Herein the lower mold 116 preferably presents a profile for positive reception of the paperboard cutouts 10, so that the peripheral flanges 52 of the paperboard cutouts 10 are supported in a sealed manner. The upper mold 118 is moreover designed such that heating means 172 may be accommodated. 173 and 173A represent recesses in the upper and lower parts 116,118, which are designed in accordance with the gripping recesses GM.

- 30 Fig. 4 shows the front view of the forming station FS. It can be seen that the lower mold 116 presents ridge-type Inserts 166 whose shape is adapted to a cross-section of the aligned and erected trays 10. The closely contiguous peripheral flanges of adjacent trays 10 fittingly rest on these ridge-shaped inserts, so that in the approached state of tool parts 116 and 118 the individual trays are moreover positively
- 35

supported by the provided mold inserts 158, the surface contours of which fittingly correspond to the shape of the single trays. The operation of the forming station FS, in particular the Skin method, shall be briefly described in the following:

5

When a row of erected paperboard cutouts, which are aligned in close contact by their peripheral flanges and thus form a saddle-shaped support, is introduced into the forming station FS by means of the tack-welded plastic film 134 (tack-welding points), then the previously
10 lowered lower tool part 116 of the forming station FS moves upwards in the direction of the arrow. While the lower tool part 116 is approached towards the upper tool part 118, a nearly perfect vacuum is applied in the upper tool part 118. The compound plastic film 134 overlying the aligned, closely contiguous paperboard cutouts 10 is thereby brought
15 into full-surface contact with the heating plate 172 and heated throughout.

Following termination of the specified heating period, the upper tool part 118 is aerated at concurrent evacuation of the lower tool part 116.
20 This change results in a differential pressure of approx. 1 bar bringing about full-surface thermo-bonding between the compound plastic film and the tray insides (cf. phantom line 134A). As linear openings remain between the side wall portions 43 owing to the configuration of the tray part 40, sucking-in of the film may even be supported.

25

At the same time, the continuous peripheral flanges 52 are heat-bonded over their entire surface.

As the inner surfaces of the closely contiguously aligned
30 paperboard cutouts are now lined with the compound plastic films, the forming station FS is opened in synchronicity, whereby the trays now coherently connected by the compound plastic film are released and conveyed for loading by the transport chain 148.

35

Fig. 10 shows the row of paperboard cutouts formed by the closely contiguous trays 10 lined on the inside and cohering by the compound

plastic film 134 as it is leaving the forming station FS. It can also be seen that the compound plastic film 134 also covers the gripping recess GM in the peripheral flange.

5 In Fig. 10A (sectional view along the peripheral flange 52 of a tray 10 with an overlying compound film 134), the single layers constituting the compound film are represented. The compound plastic film 134 comprises an oxygen barrier layer 136, preferably of polyvinyl alcohol (EVOH) and a seal layer 138, preferably of peelable polyethylene, as well
10 as an adhesive layer 137, preferably of modified polyethylene. It was found that the internal lining of the carrier material forming the food package may be executed to be extremely thin. The film thickness in the region of the remaining wall thicknesses in the rounded bottom portions preferably lies between 25 and 30 μm .

15 Through selection of a suitable surface structure of the paperboard on the inside of the trays 10, interlocking of the film 134 with the paperboard may be optimised further.

20 The compound plastic film 134 may in addition be constructed and adjusted in its properties such that it may be peeled from the paperboard substrate after use of the package, whereby unalloyed components are provided for disposal or recycling. In accordance with the invention, the gripping recess GM serves the same purpose.

25 After leaving the forming station FS, the cohering trays 10 pass through the loading station along the loading path BS while being loaded with the food products to be packaged. Transport of the cohering trays 10 by the common plant is equally performed in fixed-cycle control.
30 From the loading path BS, the loaded trays 10 enter into the evacuating and sealing station VS where they are fittingly received by the lower part 16 thanks to corresponding form inserts (see Fig. 11). Such an evacuating and sealing station having the conventional construction consists of a lower part 216 and an upper part 218 which are moved
35 apart and approached in fixed-cycle control. The lower mold 216 preferably has a profile for completely receiving the trays 10 designed in

accordance with the invention in such a way that the peripheral flanges of the trays may be supported sealingly. The upper part is designed such that it may accommodate the heating plate 274 presenting a line pattern, movable in a vertical direction.

5

The line pattern is designed such as to define planar regions at which sealing of the paperboard cutout peripheral flange with the lid film 120 is to be performed.

10 Fig. 12 illustrates the function of such an evacuating or sealing tool used in accordance with the invention. For this process step, previously known and well tried conventional systems may equally be employed with slight modifications. Fig. 12 shows the lower mold 216 with the
15 ridge-type inserts 266, the shape of which is adapted to a cross-section of the saddle strip forming between two adjacent peripheral flanges of the trays 10, so that in the approached state of the tool parts 116 and 118 the cohering trays 10 are positively supported by the provided mold insert 258, whose surface contour corresponds to the shape of the trays placed thereon. Reference number 270 designates gaskets against
20 which the peripheral flanges, or the saddle ridges, of the cohering trays 10 rest in the approached condition of the tool 216 and 218, so that evacuation of the single paperboard cutouts already containing the food products in this state may be performed.

25 274 designates heating means accommodated in the upper tool part 218 in accordance with a pattern aligned with the peripheral ridges, with sealing of the lid film 120 with the respective flanges of the individual containers being carried out in the approached condition of the tool parts 216 and 218, such that an annular continuous sealing surface
30 is created.

Owing to the particular design of the continuous flanges 52, sealing is effected free of capillary channels which might allow gas exchange with the environment.

35

In this place it should be noted that it is possible to employ a commercially available evacuating station wherein it is possible to also carry out gas charging following evacuation, e.g. with the customary gas mixture N_2/CO_2 mostly in the ratio of 70:30. The heating plate 274
5 located in the upper part of the tool 218 is preferably formed to comprise raised sealing ridges, with the lid film being sealed with the seal coating of the annular peripheral flange and the resulting saddle ridges of the cohering trays through the influence of heat and pressure.

10 Fig. 12 shows the trays 10 which are loaded with food products, sealed and cohered, after leaving the evacuating and sealing station.

As can be seen from the chosen hatching, the entire compound plastic film 134 is heat bonded to the lid film 120 at the provided sealing
15 surfaces. Merely in the range of the gripping recess shown under GM and provided in the rear flange region (when viewed in the direction of production), sealing of the compound plastic film 134 with the lid film 120 is prevented by a special design of the sealing tool. This makes it possible, by making use of the punched portion of the gripping recess
20 GM provided in the rear flange and of the lid film 120 not sealed with the compound plastic film 134 in this location, to later on peel off the film lid or peel out the compound plastic film from the tray 10.

Having left the evacuating and sealing station VS, the loaded
25 paperboard cutouts cohering by the lid film and the compound plastic film 134 are supplied to a preferably two-stage separating plant 181, 182.

It is equally possible to employ combination punching and
30 separation of the individual food packages. In combination punching the second separating step is thus omitted. After leaving the separating station, the single trays are present as shown in Fig. 13.

By the above described food package it is made possible,
35 depending on the desired design of shape, to save an average of about

20 g of non-recyclable plastics per food package, i.e., approx. 70% of the quantity incurred in conventional packages of this type.

The operational width of the device is, of course, not limited.

- 5 Nevertheless it has been found that the widths should amount to at least 420 mm in order to maintain a particularly high level of cost-effectiveness of the device.

- 10 The lid film 120 is preferably also produced of a compound plastic film 134 containing an oxygen barrier layer which is covered by a peelable plastic layer preferably of modified polyethylene on the side facing the paperboard cutout. This layer then forms the sealing seams with the compound plastic film 134 over seal ridges of the peripheral flanges.

- 15 The film layer facing the heating or sealing member 272 preferably is a type of film having a particularly high melting point or a thermal barrier layer preferably containing polyethylene and overlying the oxygen barrier layer, to provide for sufficient dimensional and planar stability
20 upon sealing with the lower mold part in the sealing process. Inasmuch as the seal layers of the paperboard cutout surface as well as of the lid film 120 are preferably adapted to each other such as to be "peelable", in sealing these two seal layers a solid combination is created which may be peeled by hand largely without destroying the paperboard cutout
25 sheet 34 (see Fig. 14).

- It will be appreciated that embodiments different from the above described one are possible without departing from the gist of the invention. Thus it is a matter of fact that the number of aligned fed trays
30 may be varied according to desire per row or work cycle.

- It is equally conceivable to degerminate or sterilise the rows of plastic cutouts by means of a particular device after they have left the forming station FS. Advantageously this will be a so-called "hydrogen
35 peroxide/hydrogenated water shower".

Due to the employed method of the invention in the oxygen-tight compound plastic film as well as in the oxygen-tight lid film 120, a compound combination of films of the polyolefin group may be employed. This compound combination can be recycled as a monofilm. It
5 was found that this regranulate may be used as a filler material in the field of high-density PE film production.

Due to the internal lining performed with the compound plastic film, stability of the tray is improved quite considerably, particularly owing to
10 the peripheral flanges designed according to the invention. Following its consolidation the compound plastic film 134 considerably loses flexibility and additionally reinforces the tray over the peripheral flanges.

In subsequent sealing with the lid film over the annular flanges, the
15 paperboard cutout is provided with additional bonding strength and torsional rigidity.

Extremely secure sealing with the paperboard cutouts lined with barrier layer compound film by means of the barrier layer lid film is
20 created in accordance with the invention in that the closely contiguous annular flanges form so-called saddle ridges with a sealing surface which is increased to the two-fold of conventional peripheral flanges.

As the entire available sealing surface thermo-bonded with the seal
25 side of the barrier layer plastic compound film 134 is available as a sealing surface with the lid film 120, a sufficiently wide area for the formation of a secure sealing seam is regularly ensured by the separation which is performed only after sealing.

In individually supplied trays not having this particular formation of
30 the peripheral flange in accordance with the invention, a homogeneously wide and thus sufficiently secure sealing surface cannot be obtained owing to tolerances upon fixation of the paperboard cutouts in the method process or owing to variations in paperboard cutout design
35 resulting from production conditions. Separation of the oxygen-tight film inner component from the inherently stabilising paperboard cutout is

another essential point of the invention (cf. Fig. 14). The compound plastic film lining the inside of the paperboard cutout is combined with the fibers of the inner walls and of the bottom surface of the paperboard cutout by thermo-bonding.

5

By known methods, for example the Multivac Skin System, wherein the compound plastic film, which is heated and thus rendered ductile, with the specially produced lamination, preferably containing a Surlyn mixture by Dupont or a mixture (PE type) having a particularly high
10 (preferably more than 20%) ethylene vinyl acetate content, the compound film, having been rendered ductile, is pressed against the tray's inner surfaces by the corresponding pressure difference and may penetrate into the fibers of this inner surface.

15

Following evacuation or application of gas, respectively, the lid film 120 is in the sealing station firmly combined with the bottom part of the packages over the annular peripheral flanges and the saddle ridges of the aligned, cohering paperboard cutouts which are coated with a seal layer as set forth in the description of the method.

20

The provided semi-oval recess (GM) of the rear flange in the direction of transport, and the corresponding design of the sealing tool in this range creates the possibility, by means of a so-called gripping lug which is formed by lid film not sealed with lining sheet in this place, to
25 peel the entire compound at the provided gripping recess GM from the resulting pure paperboard cutout which may then be composted as an unalloyed material.

Another range of application of the food package is to peel the lid
30 film off the sealing ridges in order to open the packages and enable easy removal of its contents without a tool. This may be achieved by a particular design of the sealing tool in the sealing station not incurring any major modification work.

35

In this case the consumer will remove the lid film from the sealing surfaces until he can easily take out the contents (see Fig. 15). The

compound plastic film and the lid film not entirely peeled off are then jointly removed via the gripping lug from the actual paperboard cutout at the gripping recess provided for this purpose. Hereby separation into unalloyed materials has been performed, and the single materials may thus be supplied to their further recycling.

Fig. 16 shows a schematic view of a tool for manufacturing the trays 10. In a bottom mold 316, the paperboard cutout 40 is erected and fittingly stabilised by means of air evacuation means 319. The upper mold 318 carrying the erected collar with flange 52 is arranged in alignment above the bottom mold.

Approaching the molds 316, 318 is carried out after applying a cold or hot-melt adhesive on the overlapping surfaces of side walls and/or tabs. If hot-melt adhesive is used, the setting time may be controlled more precisely to thereby further raise the cycle times during production. In Fig. 16 the areas for application of adhesive are shown with varying shapes, which is to indicate that there is a variety of alternatives in design depending on the strain profile of a tray.

It is, of course, possible to carry out modifications without departing from the inventive concept. Fig. 17 shows a somewhat modified configuration of the trays. The collar 452 is formed without tabs and accurately placed over the angularly extending flange segments 444 of the side walls 443 of the tray parts 440 and fixedly connected, preferably bonded, with these. "x" designates those areas wherein adjacent wall segments 443 are connected to each other by overlapping tabs 443 A.

For this tray, a modification of the packaging plant in accordance with Fig. 18 may be meaningful. Erected or pre-fabricated trays 510 are taken from a magazine 512 to form rows, and transferred to a fixed-cycle conveyor belt 511. The trays 510 are then transported underneath a plug device including a plug 517 wherein the flange formed by the segments 444 is folded prior to setting the collars 452 in position in the bonding station KS, namely in such a way that a surface as planar as

possible for positioning the collars and optimum alignment of the sections 444 is created. The plug 517 is designed such that the peripheral flange 552 is folded into a sealing position permitted by the respective predetermined cut at the ends of the peripheral flange segments 444, wherein it has a corresponding inclination. The bonding station is followed by the transfer station ÜS (see Fig. 1).

If a method according to the known Tray-Sealer is employed, the transport chain 148 transports the trays 10 arranged in closely adjacent alignment into the forming station FS in fixed-cycle control. The forming station FS may also be designed e.g. like a station operating in accordance with the Skin-System of a forming, loading and sealing plant in accordance with Multivac CD6000.

The invention thus furnishes a food package having the form of a dimensionally stable paperboard cutout with a top side peripheral flange which, according to the invention, is continuous and placed on the tray part. The seal surface along the flange in this way is imparted a particularly high quality ensuring permanent tightness.

The substrate tray consists of paperboard and carries on the inside in the range of the flaps formed into the peripheral flanges an oxygen barrier plastic film suited for sealing with the lid film.

There is moreover described a method, a device for producing an oxygen-tight food package, wherein pre-formed and dimensionally stable trays are supplied by a dispenser system or, in the case of insertion through a so-called Tray-Sealer, i.e. direct insertion from the dispenser into the receiving molds of the transport chain of a Tray-Sealer. In a forming station these trays are lined with a compound plastic film preferably containing an oxygen barrier layer.

Claims

1. Food package comprising a substrate tray with an annular peripheral flange, which is lined on the inside with a plastic film, in particular a compound plastic film encompassing the peripheral flange, with the substrate tray inner cavity being hermetically closed off or sealed by means of a preferably oxygen-impermeable lid film over the peripheral flange, characterised by a tray part (40) the package bottom (41) and at least partly the side walls (43; 443) and a collar placed thereon and constituting the peripheral flange (52).
2. Food package according to claim 1, characterised in that the peripheral flange (52) stabilises the side walls (43).
3. Food package according to claim 2, characterised in that the peripheral flange (52) comprises tabs (51) fastened to the side walls (43) of the tray part (40).
4. Food package according to claim 3, characterised in that the tabs (51) are fastened to the inside of the side walls (43).
5. Food package according to any one of claims 1 to 4, characterised in that the tray part (40) and/or the collar (52) is constituted by a paperboard cutout.
6. Food package according to any one of claims 1 to 5, characterised in that the compound plastic film (134) comprises an oxygen barrier layer (136) preferably of polyvinyl alcohol and a seal layer (138) preferably of peelable polyethylene as well as an adhesive layer (137) preferably of a modified polyethylene, in particular a copolymer of ethylene with 6% methacrylic acid partially (50%) neutralised with Na or zinc ions (Surlyn A).
7. Food package according to any one of claims 1 to 6, characterised in that the lid film (120) is formed by a compound plastic film (134)

having on the side facing the paperboard cutout (10) a preferably peelable plastic layer, preferably of polyethylene, and at least one oxygen barrier layer overlying it, preferably of polyvinyl alcohol, and a covering thermal barrier layer for example of polypropylene.

5

8. Food package according to any one of claims 1 to 7, characterised in that the plastic film has a starting thickness in the range between 100 and 150 μm depending on the molding depth.

10 9. Food package according to any one of claims 1 to 8, characterised in that the tray part (40) and/or the collar (52) consists of a recyclable, preferably multi-layer paperboard.

15 10. Food package according to any one of claims 1 to 9, characterised in that the paperboard comprises a cover layer facing the outside of the package and having a first surface structure e.g. suited as an information carrier layer, and an inside second layer having a specific surface structure.

20 11. Food package according to claim 10, characterised in that the second layer preferably consists of recycled paperboard.

12. Food package according to any one of claims 3 to 11, characterised in that the tabs (51) are bonded with the side walls (43).

25

13. Method for gas-tight or oxygen-tight packaging of foodstuffs in a food package according to any one of claims 1 to 12, wherein the trays comprised of tray part and peripheral flange pass in fixed work cycles through a forming station (FS) and a loading path (BS) followed downstream by an evacuating and sealing station (VS), with the trays being aligned in a row in the forming station (FS).

30

14. Method according to claim 13, characterised in that the trays (10) are supplied to the forming station (FS) in a pre-fabricated condition.

35

15. Method according to claim 13 or 14, characterised in that lining of the inner surfaces of the substrate trays is preferably performed in line and by means of a compound plastic film (134) covering the entire seal surface of the peripheral flanges (52), which is tack-welded (tack-welding points) to the peripheral flanges of the trays in a transfer station (ÜS) arranged downstream of the forming station (FS).
16. Method according to claim 15, characterised in that transport of the trays (10) through the following stations is performed by means of the plastic film (134) forming the lining which is grasped edgewise by gripping organs of transport means, preferably a transport chain (148).
17. Method according to any one of claims 13 to 16, characterised in that the compound plastic film (134), optionally after heating, is formed into the trays (10) by generating a pressure difference, and is solidly heat-bonded with the respective peripheral flange and the inside of the associated trays (10).
18. Method according to any one of claims 13 to 17, characterised in that the trays (10) cohering by the lining compound plastic film (134) are preferably heat-bonded continuously in the evacuating and sealing station (VS) with a lid film (120) over the annular peripheral flange (52).
19. Device for carrying out the method according to any one of claims 13 to 18, characterised in that the forming station (FS), loading path (BS) and the evacuating station (VS) are combined into a first module (I) preceded by a feed unit for the pre-fabricated trays (10) which forms a second module (II), with the two modules (I and II) overlapping in the direction of transport of the trays (10).
20. Device according to claim 19, characterised in that the first module (I), upstream of the forming station (FS), comprises a tack-welding

station (HS) under which a transfer station (ÜS) for the trays (10) of the second module (II) is located.

- 5 21. Device according to claim 20, characterised in that the transfer station (ÜS) comprises a vertically movable lifting device supporting the peripheral flanges, and the tack-welding station (HS) comprises tack-welding bodies (118) vertically movable in the opposite direction, whereby the plastic film (134) forming the lining and passing therethrough is tack-welded to the peripheral flanges (52).
- 10 22. Device according to claim 21, characterised in that the tack-welding bodies (118) may be heated.
- 15 23. Tray for a package according to any one of claims 1 to 17, characterised by a tray part (40) forming the package bottom and at least partly the side walls, and a continuous collar placed thereon which forms the peripheral flange (52).
- 20 24. Tray according to claim 23, characterised in that the peripheral flange (52) stabilises the side walls (43).
- 25 25. Tray according to claim 24, characterised in that the peripheral flange (52) stabilises the side walls (43).
- 30 26. Tray according to claim 25, characterised in that the tabs (51) are fastened to the inside of the tray part (40).
- 35 27. Tray according to any one of claims 23 to 26, characterised in that the tray part (40) is a paperboard cutout.
28. Tray according to any one of claims 23 to 27, characterised in that the side walls (43) conically extend downward.
29. Tray according to any one of claims 23 to 28, characterised in that the bottom (41) has a polygon shape.

30. Method for producing a tray according to any one of claims 23 to 29, characterised in that the cutout of the tray part is initially erected in a first mold (315) and that the collar (52) is subsequently accurately placed thereon in a second mold (318) and connected, preferably bonded, with the latter through selected areas.
- 5
31. Method according to claim 30, characterised in that bonding is performed by means of a cold adhesive.
- 10 32. Method according to claim 30, characterised in that bonding is performed by means of a hot-melt adhesive.

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

Abstract

- 5 What is described is a gas-tight, preferably oxygen-tight food package comprising an annular peripheral flange, which is lined on the inside with a plastic film, in particular a compound plastic film, and the inner cavity of which is closed off or sealed over the peripheral flange such as to be gas-tight, in particular oxygen-tight, by means of a lid film.
- 10 For improving manufacturing properties while ensuring lasting gas-tightness of the package, a tray part (40) forming the package bottom (41) and at least partly the side walls (43; 443) is provided, on which a collar forming the peripheral flange (52) is placed.

German Language Declaration

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Staatsangehörigkeit	Citizenship
Postanschrift	Post Office Address
	Same As Residence

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Declaration and Power of Attorney for Patent Application

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Ich erkenne meine Pflicht zur Offenbarung jeglicher Informationen an, die zur Prüfung der Patentfähigkeit in Einklang mit Titel 37, Code of Federal Regulations, § 1.56 von Belang sind.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Airtight Food Packaging And A Method,
Device and Tray For The Production Thereof

the specification of which is attached hereto unless the following box is checked:

was filed on December 20, 2000
as United States Application Number or PCT
International Application Number
09/720,525 and was amended on
03/12/01 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

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Prior Foreign Applications
(Frühere ausländische Anmeldungen)

19828381.4 Germany
(Number) (Country)
(Nummer) (Land)

PCT/EP99/04399 PCT
(Number) (Country)
(Nummer) (Land)

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(Application No.) (Filing Date)
(Aktenzeichen) (Anmeldetag)

(Application No.) (Filing Date)
(Aktenzeichen) (Anmeldetag)

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(Application No.) (Filing Date)
(Aktenzeichen) (Anmeldetag)

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Priority Not Claimed
Priorität nicht beansprucht

25 June 1998 ☐
(Day/Month/Year Filed)
(Tag/Monat/Jahr der Anmeldung)

24 June 1999 ☐
(Day/Month/Year Filed)
(Tag/Monat/Jahr der Anmeldung)

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Status) (patented, pending, abandoned)
(Status) (patentiert, schwebend, aufgegeben)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.